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AUTHOR Dinham, Sarah M.
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ABSTRACT

Drawing parallels between designing and teaching, this paper reviews current thought about teaching and teacher thinking, illustrates possibilities for research on studio teaching, proposes recommendations for design instruction improvement, and analyzes reasons for teachers' selective adoption of new ideas about teaching using the Portsmouth Design Group's model. Many and often conflicting conceptions of instruction are reviewed, summarizing what instruction entails, including the mental activities that occur when one is instructing. Two instances of research on studio instruction are presented, offering examples of the kinds of findings the systematic scrutiny of architectural teaching might bring. The paper's concluding section illustrates questions that might be explored and resistance to new ideas that must be overcome if studio teaching were more empirically addressed. A list of 27 references is appended. (Author/JD)

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TEACHING AS DESIGN:

THEORY, RESEARCH, AND IMPLICATIONS FOR DESIGN TEACHING

Sarah M. Dinham, Ph.D.
Colleges of Architecture and Education
The University of Arizona
Tucson Arizona 85721 USA

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ABSTRACT

Drawing parallels between designing and teaching, this paper reviews current thought about teaching and teacher thinking, illustrates possibilities for research on studio teaching, proposes recommendations for design instruction improvement, and analyzes reasons for teachers' selective adoption of new ideas about teaching using the Portsmouth Design Group's model.

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This discussion proposes that teaching can be seen as a design task -- as an effort to conceptualize and then bring about certain changes to a positive end. This premise implies that the function of teaching is to arrange -- to design and implement -- a context in which learning can flourish. It implies too that the thought and action of teaching can be studied, just as are the thought and action of design, and that improvements in design teaching can be implemented and their effects assessed.

Descriptions of what designers do and what teachers do are arresting in their parallels. Schon (1) summarizes several views of designing in which the words "teachers" and "teaching" could easily be substituted:

> Designing in its broader sense involves complexity and synthesis....Designers juggle variables, reconcile conflicting values, and maneuver around constraints--a process in which, although some design products may be superior to others, there are no unique right answers. [Some have focused on] the management of complexity; others, on imagining an ideal to be realized in practice; still others, on search within a field of constraints....I prefer Dewey's view of the designer as one who converts indeterminate situations to determinate ones....designing is a web of projected moves and discovered consequences and implications (pp 41-42).

Teaching in its broad sense does indeed involve complexity and synthesis. Teachers juggle myriad variables, reconcile conflicting values, and maneuver around constraints -- processes in which, although some outcomes may be superior to others, there are often no unique "right" answers about students' optimal learning. We can indeed view the teacher as one who converts indeterminate situations to determinate ones. Teaching consists of fashioning an intricate set of efforts and discovering their consequences and implications.

Some models of designing seek to explicate the "creative act" by analyzing its stages (2) and some characterize designing as straightforward instrumental problem solving; most informed views of designing and also of teaching are exceedingly complex (3). Both designing and teaching involve searching for --or creating -- order and purpose in ill-defined situations often laden with uncertainty, ambiguity, and value conflict (1). The parallels between designing and teaching can be extended further: for example, effective teaching -- like effective architectural design -- occurs deliberately, with conscious attention to alternative modes of thinking, strategies for resolution, and courses of action.

The effects of design strategies may also be likened to the effects of teaching strategies. For example in exploring varied designers' interpretations of seemingly similar design programs,

Goldschmidt (4) identified ways that some designers respond to core elements in the program while others respond to more peripheral elements. She found that often a designer fails to recognize that certain issues are 'remote;' instead the designer sees them as more central than would other designers. Goldschmidt notes that drifting into the periphery results in either irrelevant or very innovative design. Teaching, too, can vary as much with the teacher as with the educational task. When teachers move to the periphery the result can be either brilliantly inspiring or harmfully inept.

The work of other researchers also suggests parallels between designing and teaching and learning. For example Newland, Powell and Creed (5) in summarizing Cross and Nathenson's linking of design processes and learning, suggest that if the Cross and Nathenson analysis is right, theories of learning might be useful in illuminating the design process. Similarly if teaching can defensibly be conceptualized as a design process, it could be that designers would see their own teaching in a new way.

If parallels between designing and teaching are tenable, it can be argued further that teaching, like designing, is amenable to analysis and improvement. Teaching like designing can be studied not merely for the esoteric exercise but also because revealing the essence of good teaching can suggest important implications for improving architectural education.

FOCUS ON THE STUDIO

Like much of the current interest in architectural education, this paper considers the place -- and the events -- of the design studio. The first reason for this focus is that although there is an extensive educational literature on traditional lecture and seminar college instruction, there is virtually none on forms of "apprentice" teaching such as studio teaching or clinical internships (6). And second, although there is some controversy about how design curricula should be crafted, through the years the studio has become the curriculum's core, for better or worse (for example for architecture, see 7, 8, 9). For several reasons, then, it is studio teaching that invites the current scrutiny.

This paper addresses questions about studio teaching from several perspectives. First reviewed are the many and often conflicting conceptions of instruction -- particularly summarizing what instruction entails, including the mental activities that occur when one is "instructing." This review draws on some very recent research on teaching, offering implications about the ways that current work in educational psychology can expand our view of architectural studio teaching. Next discussed are some of the more vexing problems in studying instruction. Following are two instances of research on studio instruction, examples of the kinds of findings the systematic scrutiny of architectural teaching might bring. The paper's concluding section illustrates questions that might be explored

and resistance to new ideas that must be overcome if studio teaching -- indeed design education in general -- were more empirically addressed.

WHAT IS INSTRUCTION?

Over the years the term "teaching" has taken a variety of meanings. Teaching involves a great constellation of activities, from the broadest, such as development of character (10) or conceptualizing one's perspective of the subject to be learned (11), to the more specific such as fashioning the next studio project, reading material to prepare for next week's lecture, advising students, meeting with other faculty, directing theses, sitting on reviews, and of course direct instruction through contact with students in the classroom and studio.

In architecture many instructors see teaching solely as criticism -- either because they believe criticism is the epistemological foundation of architectural thought or because to them criticism represents the "real world". This approach has complicated historical and theoretical foundations that need no repetition here; when criticism is defined in its largest sense, the approach can be very positive. Sadly, however, many teachers see "criticism" more narrowly. Many design teachers who instruct exclusively through criticism use a self-serving style whose benefit to students' learning is indirect at best. This version of studio instruction can be decidedly negative; what students learn is often quite different from what teachers

intend. For example, exclusive attention to the design product can give students little guidance on how to think about producing better products. In recent years the overall trend seems to have been toward more constructive criticism, however, and the preeminence of the critical ego seems to be lessening.

Constructive intentions do seem to be the rule rather than the exception among architecture studio teachers. In my own research on studio instruction in four U.S. architecture schools I saw many instances of positive and articulate instruction. Even at schools known for their theoretical orientation, thoughtful faculty members recognize the complex intellectual demands of developing their students' design thinking.

One Berkeley faculty member explained recently (12), for example, that his interest is in "assisting students to develop. I see them as self-motivated. I'm not interested in imposing my own framework on what they do. I want them to have confidence in their own design decisions....I try to show the students a range of solutions, ... to see both the uniqueness and the similarities" (p.10).

Conceptions of teaching proposed by traditional theorists outside architecture have long been insufficient for explaining the subtleties of studio teaching. In the heyday of behaviorist learning theory, research on teaching consisted of studying "teacher behaviors," such as use of the chalkboard or liveliness in lecturing, and design teachers quite appropriately found the resulting discoveries irrelevant to their conceptions of

teaching.

Entwistle and Ramsden (13) point out the inadequacy of another approach, the simplistic "input-output" model describing "students entering university with a bundle of characteristics and leaving it with or without a good degree." With tongue firmly lodged in cheek they remind us, "it seems that something happens during the period of the student's university experience which traditional research has not examined." (p 3).

Indeed, for many years the model of teaching held in many instructors' minds has been the "teacher as teller," a model that persists in many university settings today, and in some cases even in the studio. Fox (14) called this the "transfer" view of teaching: knowledge is a commodity to be transferred from one vessel to another and the teacher's role is to possess and dispense the commodity. The teacher-as-controller-of-information model was abandoned some years ago by learning and instructional theorists, although it remains firmly lodged in the day-to-day practice of literally millions of teachers the world over.

More recent conceptualizations of instruction apply more felicitously to the studio. One view is that teaching is a process of shaping or molding the student to a predetermined pattern -- a view well suited to the atelier. Another model proposes that the instructor is a manager or orchestrator of the events occurring simultaneously in the studio. This "orchestrator" model is useful in reminding us how complex the

intellectual task of instruction can be, and how many ideas must be retained consciously and unconsciously in the instructor's mind.

Both the "controller" model and the "orchestrator" models emphasize the instructor, however, rather than the student. They both imply that responsibility for student learning lies largely with the instructor. Experienced teachers have long found this explanation of instruction far too simplistic, and consequently have found these models insufficient. Recent research also suggests that these traditional views of teaching grossly underestimate the requirements for successful learning.

Fenstermacher (15) has exposed another set of problems in defining teaching -- the errors in presuming causal relationships between teaching and learning. "Learning," he points out, is a term used in two ways in discussions about teachers and students: "learning" is a noun, an outcome, one of the desired results of education, but "learning" is also a verb form describing a process, a process necessary for realizing the desirable outcomes also called "learning." It is true that teaching is so closely related to outcomes that the two inevitably become linked; it is a mistake, however, to "be lulled into thinking that one causes the other" (p 39). Rather, Fenstermacher argues, learning results when the process, the task, of being a learner has taken place. Teachers influence learning by fostering students' attempts at this task. Fenstermacher asserts, then, that "a central task of teaching is to enable the student to perform the

tasks of learning" (p 39). With this assertion Fenstermacher replaces earlier conceptions of teaching -- views of teachers as deliverers or orchestrators held responsible for the products of students' work -- with the conception that teachers are accountable rather for designing and managing the educational environment -- the activities that foster learning.

Fenstermacher, an educational philosopher, is not alone in this conceptualization. The past few years have seen increasing support for the view that teaching involves designing an environment for maximizing learning. The psychologists Entwistle and Ramsden (13) and Yinger (16) discuss similar themes. Fox describes this view of teaching as "traveling" with the student through the subject matter as if it were a terrain to be explored with the teacher as expert guide. Gagne, a noted learning theorist, observes succinctly: "Besides the student who is learning, the most important agent in an educational program is the teacher. The teacher is responsible for arranging the student's environment to promote learning" (17) (p 2).

Designing an environment to promote learning is an extremely challenging task. Attacking this challenge requires -- as with all complex practical problems -- the special expertise held by experienced professionals. From recent writings on how expert professionals in fields such as architecture, music, and clinical psychology perceive and approach practical problems have come a host of interesting views on how teachers design the complex environment for learning occurs (1, 16). Professionals --in this

case studio instructors -- can be seen as "practitioners who specialize in designing practical courses of action to serve the needs of a particular client group." They design practical courses of action in complex situations -- in this case the studio curriculum -- and "what allows them to do this is a thoughtful and purposeful consideration of their [instructional] practice" (16). This rich literature reminds studio instructors that they are dual professionals: they are both designers and studio instructors, simultaneously performing two professional tasks, each of immense complexity.

THE METHODS FOR RESEARCH ON STUDIO INSTRUCTION

Can research be possible on a subject as diverse and controversial as studio instruction? Some believe that it is impossible to study teaching (seen as ineffably personal), to study learning (bewilderingly idiosyncratic) or to study thinking (too complex for scrutiny). This is nonsense, of course; it is just as much nonsense as the assertion that because every design project is unique there are no general design principles applicable across projects.

The current research on instruction is yielding new and revealing pictures of teaching as a complex intellectual activity. For example, this research

> ...suggests that what teachers do is strongly influenced by what and how they think, i.e. little of

> what teachers do is merely spontaneously reactive. Also, teaching...is based on thoughtful and systematic (though often implicit) notions about students, subject matter, teaching environments, and the teaching process itself....Teaching involves complex social and interactional processes such as clear communication, mutual negotiation of action, and joint construction of meaning. Also, experienced teachers draw upon and successfully orchestrate tremendously large bodies of knowledge (subject matter, social, technique) in idiosyncratic contexts. (16)

There could be no more eloquent argument for new research on studio instruction than this description of its rich untapped complexity. One can see that the challenges are monumentally intriguing.

In a vivid description of a game played by designers, teachers, and others -- a game called "mystery/mastery" -- Schon (18) shows how designers sometimes "mystify their artistry, treating it defensively as an indescribable something that either one has or has not" (p 7). The parallel between designing and teaching applies: some teachers certainly seem to mystify their teaching, holding their teaching impervious to scrutiny. Such teachers would resist the notion that teaching can be studied systematically. Notwithstanding the opinions of these few, the possibilities for empirical research in architectural education are great, and cannot be ignored (19).

New conceptualizations of teaching call for visionary and complex research methods beyond our current abilities. The research techniques for studies of complex mental operations have not developed well enough to capture the nuances of studio instruction, both because research on instructors' thinking is so difficult and because research on studio instruction necessitates a visual element beyond current methodologies.

Two approaches have been used to date in research about studio education: observation studies and survey studies. Observation studies are best exemplified in the monumental Architecture Education Study (20), a series of extended case studies observed at several schools and meticulously analyzed by a sophisticated and diligent research team. The Study concentrated more on students' experiences than instructors' thinking, revealing important findings about the realities of fledgling architects' experiences. Unfortunately the Study, with perceptive conclusions and insightful recommendations that have been largely ignored, offered little to guide instruction or instructional improvement. Another set of observation studies is the research currently underway at the University of Arizona, described below. This set of studies is yielding some recommendations for studio instruction.

Studies employing questionnaires and interviews are best illustrated by Anthony's (21) work on juries, and Kasparowitz's (9) comparison of design fields, principally from an organizational perspective. Neither of these researchers had the

funding of the Architecture Education Study, and neither was able to examine studio instruction itself, although Kasparowitz interviewed faculty members extensively and drew conclusions about their thinking on architecture education in general.

While research on studio education in general has captured at least these researchers' interest, research on studio instructors' thinking and their in-studio instruction has received less attention. What could be the benefit of studying teachers' thinking? Clark (22) suggests three areas in which the current state of knowledge about teacher thinking can inform the education of new teachers or the refinement of experienced teachers' abilities: in studying teachers' preconceptions and implicit theories, in examining their planning and reflection about teaching, and in considering their dilemmas and uncertainties about teaching.

If studio teachers' thinking and their guidance of student work were to be the focus, what approaches might prove most fruitful? Research on instructors' thinking and practice in other fields has employed many research techniques, none entirely satisfactorily. Most recently, an approach called "stimulated recall" has been popular: videotapes of instruction (whether with an entire classroom or a single student) are played back for the teacher and a trained questioner, who together try to reconstruct the teacher's thinking. This technique has seemed the most promising for studio research, because representation is so important in architectural instruction. However, very recent

writers have disputed the validity of this technique, pointing to problems of short-term versus long-term memory of fleeting thoughts (23). These problems notwithstanding, there seems to be no other solution for research on studio teachers' thinking about visually depicted ideas, short of hypnotic recall.

In sum, the methodology for studying instructors' thinking has lagged behind our desire to reveal and examine the intricacies of design studio instruction. While the current literature on designing and design education is provocative, it does not often directly address teaching. And the few explorations of design teaching -- both observational and survey -- have not until very recently delved into instructors' thinking and actual communication with students. The efforts described below have made both attempts.

As an illustration of the potential for systematic study of studio teaching, two studies reported elsewhere (24,25) are summarized below. Following these summaries, the studies' implications for teaching reform are illustrated and their implementation is discussed.

RESEARCH ON TEACHERS' THINKING AND PLANNING

Theoretical foundations

A recent study of teachers' thinking and planning (24) rested theoretically in work on the relationships between teachers' beliefs (in this case beliefs about design, teaching,

students, and learning) and their actions (in this case studio instruction). Fenstermacher (15) and other educational theorists have proposed that teachers hold certain "practical arguments" in their thinking about teaching; these "practical arguments" are not traditional logical arguments but propositions that link teachers' beliefs about students or learning or the topic to be learned with their actual or intended teaching.

This research on teachers' thinking was designed to explore the influences of studio teachers' beliefs upon their instructional planning by revealing their intermediate arguments about studio instruction.

Methods

This study took place in the fall semester fifth-year studio of a five-year architecture curriculum; the two instructors were a senior, experienced and highly respected professor and his younger but not inexperienced co-teacher. This setting and faculty are typical of the teaching situations observed in our other research in four U.S. architecture schools (25).

The research procedure included (1) lengthy interviews with each teacher, (2) observation of the extended conversation in which the two brainstormed their thinking about the project assignment and made decisions about how they would teach and what students would do, (3) observation of the three occasions on which the project assignment was described to the students, (4) interviews with several students carefully selected to represent certain dimensions of ability and experience, and (5)

observations of the ongoing studio teaching and (6) evaluative reviews of the resulting work. Findings about studio teachers' practical arguments were interpreted only if verified evidence from at least three of the five independent data sources could be identified.

Findings

The study divulged several propositions about the relation between studio teachers' beliefs and their teaching actions, each a hypothesis on which teachers base their actions, each an assertion teachers make and act upon but may or may not test overtly through their teaching. An example of these findings would be the belief that leaving studio problems open is helpful for students' learning and for fostering the design process.

Through the form of verification known in interpretive research as "member checks" -- i.e. checking the findings with other "members" of the group about whom conclusions are being proposed -- this finding and the others were explored further. This process led to further discussion and confirmation by other experienced teachers of the importance and balance in "opening" and "closing" (focusing, or narrowing) the project assignment. They confirmed that the delicate balance between structuring students' thinking/work and deliberately broadening it so students will be challenged is a dilemma faced by all teachers. This choreography of "opening" and "closing" the problem presented to the students takes place at all stages of instructional planning, from formulating and expressing the

problem assignment, to the instructor's coaching of student teams and individuals, to the final stages of critique and evaluation.

RESEARCH ON STUDIO INSTRUCTION

Background

The companion to teachers' thinking and planning is, of course, its manifestation in studio instruction. The second study's aims were to discover essential, recurring elements in student-teacher exchanges -- both in desk critique and in reviews -- and then to deduce from these discoveries the most important educational themes pervading studio instruction (25).

Methods

This research used procedures typical in the social sciences for "interpretive" studies (26). The data were collected over a sixteen-month period in four U.S. architecture schools representing a wide variety in program types, from four year to six year curricula, both private and publicly-supported schools, from residential to urban-center programs. The studios ranged from a first design class undertaken in the third year of a four-year architecture program (redesign of an urban intersection) to the last undergraduate year of a five year program (alternative commercial and residential designs for a single in-town site, including zoning and marketing issues).

The data available for analysis consisted of the original written narratives collected by a trained observer from the four participating architecture schools' studios. Altogether the 761

items of information in the narratives reduced to 53 separate but inter-related themes about teaching, teachers, students, and learning. The 53 were grouped systematically into eight categories of findings: philosophies/views manifest in teaching, ideas about teaching and learning, teachers' responses to students, teachers' guidance based on student work, time, student preparation, student communication, and two-way communication.

Findings

The study's findings included teacher beliefs about design and about teaching and learning, information about the context teachers create in studio instruction, and insights about the interchanges between students and teachers. An example of teacher beliefs would be such intermediate arguments as "specific strategies that designers [should] use should be used by students learning in the studio" or "thinking is what teaching is for."

Findings about instructors' arrangements in the studio to support or impede students' learning grouped in three themes familiar to all who have worked in studios: (1) time, (2) the psychological environment teachers create, and (3) the role of students' preparation, production, and thought. Many of these principles were expressed as beliefs that teachers and/or students act upon in the studio.

The findings about actual exchanges between students and teachers yielded rich possibilities for studying teaching further. The more general findings were about communication patterns (e.g. differences in teacher communications with

different types of students); the more specific conclusions were about the ways teachers guide students. In the latter, two major patterns emerged: teachers essentially redefining students' work to specify how the student should change, and teachers elaborating from students' work by exploring student thinking. Schon's (1) two categories of strategies for apprentice teaching, called "Follow Me" and "Joint Experimentation" are similar but not identical to these two patterns for guiding student thought and work.

In short, the findings of this overall research effort illustrate the unexplored richness and intricacy of the instructional studio, and confirm that if teaching is a form of designing, the program is elaborate indeed. Questions about teacher thinking are matched in complexity by questions about the processes of instruction in desk critique, review, and jury. The research effort described in these pages merely scratches the surface of the possibilities for unfolding the mysteries of design teaching and learning.

IMPLICATIONS FOR THE PRACTICE OF TEACHING

Unfolding teachers' heuristics

Since teachers' beliefs about design and about teaching and learning are linked to their actual teaching styles and decisions, identifying those premises and examining them directly seems logical. Just as, according to Powell (25), "designers often strongly prestructure their views of problems given to

them, in order to produce a reasonable solution within the inescapable restrictions of both time and resource" (p 193), teachers too prestructure their thinking about instruction. This prestructuring is, as Powell says, a fact of the complexity, restrictions, and demands of any difficult task. Indeed, he goes on to say, private frames of reference and pragmatic heuristics serve to control the complexity of the task.

Teachers' frames of reference and pragmatic heuristics for teaching govern their teaching. Any identifiable factor this important in teaching deserves -- or rather, demands -- explicit articulation and discerning analysis. Only if teachers unfold their beliefs about design and about teaching and learning, examine them carefully, and discuss them with colleagues can they, or can the faculty at large, ensure that faculties will teach what they believe, and will teach what they intend to teach.

Questioning teachers' actions

Seeing teaching as design implies significant questions about how teachers fashion the settings for their students' learning. Because answers to such questions influence teaching, both individual teachers and faculties in design schools need to give conscious attention to these issues:

> What is my definition of design? How should I construct the course to ensure that students see this definition clearly? What strategies do I believe designers should use? Is it important to teach about other

definitions, other strategies?

What are teachers' responsibilities? What is a teacher's role in students' learning? Do teachers and students merely express two differing aesthetic judgments, and if so how can teachers evaluate students' work?

What do I believe about how students should learn? What is the evidence that these are good strategies? How can students learn to plan their designing, to ponder their own and their teachers' ideas? How should students balance, for example, attention to concept against attention to detail, or research time against production time?

How to design my contact with students to foster their best thinking? What kind of talk should pass between us? What kind of visuals? Should I concentrate on the student's thinking processes? design concepts? design details?

How should I deal with special circumstances ... better vs weaker work, more vs less likeable, energetic, shy, able, assertive students? How does my feeling awkward or assured with various students influence my teaching?

When should a teacher intentionally redesign students' work? Why and when should teachers give students new ideas, mandate new directions, suggest ways to think differently? And when should teachers elaborate from students' work, explore their thinking, help students extent their thinking, collaborate on the student's ideas?

How should I plan the time constraints in the studio?

How should I design the stresses in the studio? Is a sense of urgency beneficial? How should my own time be allocated?

How can I ensure that my communication is clear, that ideas are understood, encouragement or displeasure conveyed constructively, criticism meaningful?

Recommendations for refining studio teaching

Of all possible tangible recommendations for refining studio teaching, the most important is that design teachers separately as well as collectively ponder the preceding questions and -- upon formulating responses -- decide on and undertake the educational consequences of those responses.

If the studio is intended to be the synthesizing experience of the student's educational program, the entire curriculum must be planned so that this happy result can be realized. For example, the studio curriculum can be built as a bridge between students' early studies and the realities of professional practice; transitions across the years of the curriculum must be carefully planned and then thoughtfully instituted.

In across-the-desk studio teaching, reviews, or formal juries, teachers continuously make important decisions about their teaching. Most important, then, is that teachers should make planned, overt decisions about their teaching rather than leaving events to happenstance. (This is not to say that teachers would not want to capitalize on fortuitous opportunities, but rather that conscious attention to the rhythm and choreography of studio teaching brings about better

opportunities for students' learning.)

Teachers should consciously plan for -- rather than leaving to chance -- the effects of important but intangible aspects of the studio environment: for example allocation of student and teacher time, imposition of stress on students, the nature and utilization of studio space, expectations about students' collaboration/competition.

Both the educational theory and the growing research on studio teaching offer some concrete suggestions as well. Teachers must decide and then follow through with students on the balance of attention to students' thinking vs. the details of their products. Students are more likely to improve both of these if the teacher's guidance is specific enough for the student to see how to improve, while not being so constraining that the student becomes an automaton. Innuendo is often employed with design students under the guise of professional courtesy, while in reality it is the greatest of insults because it ignores the student's desire to learn and improve. Harsh negativity is similarly wasteful.

Students are easily confused about the nature of criticism. Because criticism is an important form of scholarly inquiry and design criticism occupies a central role in advancing the frontiers of the field, critical expression is intrinsic to design teachers' thinking. Yet for students the nature and function of criticism must be made clear. In particular, teachers must delineate for students the important difference

between casual opinion and informed, analytic criticism (which on occasion might happen to be expressed casually). Students need to realize the difference between "it's just his opinion against mine" and the reflections of the scholar-teacher-practitioner's expertise.

Teachers often deny that they have strong feelings about students, even while agreeing that studio teaching is at once a physically, intellectually, and emotionally exhausting enterprise. Teachers also often hesitate to unfold (even for themselves) their personal, intrinsic criteria for judging student work and guiding student thinking. Concealing these feelings and criteria from oneself can be unwise at best, however, and injurious at worst. The thoughtful teacher recognizes and examines -- at least in the solitude of the mind -- these important, inner influences on teaching and learning.

As a device for analyzing one's own teaching strategies, a studio teacher can benefit from such analyses as Schon's (1) distinction between teaching as leading ("Follow Me!") and teaching as eliciting ("Joint Collaboration"). Although there are some circumstances in which elaborating from students' work to move the student further is advisable, and other circumstances in which redesigning is called for, there are no firm rules about which strategy produces greater student progress. As with other decisions about teaching, the teacher's conscious awareness of these alternatives, together with his assessment of the student's present need, must yield the best strategy.

In the design of a context for students' learning to flourish -- as in the design of the context for fostering other human activities -- there are few unequivocal axioms but many important decisions. As these recommendations illustrate, the more important principle is that alternatives -- in this case alternatives for studio teachers' thought and action -- must be clearly revealed, thoughtfully examined, and deliberately implemented. The rule, then, is in the process rather than in the prescription.

Teachers' selective information application

Will design school faculties -- will teachers -- want to explore these processes? Can the answers to these questions bring about changes in thinking about teaching? What changes in faculty thinking must be seen before new information about designing student learning will be welcome? How can new information become available for design teachers' use?

The Portsmouth Design Information Research Group has assembled insightful research findings about architects' selective handling of new information (5):

> Undeniably, there is now a wealth of information emanating from many sources which could be useful to designers. Unfortunately, this well-established scientific, technical and social knowledge ... is mostly unexploited by architects and does not, therefore, become manifest in much architectural design (p 2).

Substituting the language of teaching for the language of design, one can see parallels between architects' and teachers' problems in using new research findings in their day-to-day practice of design or instruction. Teachers might say, for example,

> "Theoretically I ought to do it in the prescribed way but it's tedious sitting down and working through it ... in a varied practice you don't do any one aspect often enough to make it worthwhile becoming fully familiar ....
>
> "I get my ... information from that man over there (pointing to a fellow architect) .... I haven't got the time to spend searching for things in the library
>
> "We need for our practice, training tailored to our needs, not education in the remote ivory towers of academia." (5, p 3)

These views suggest that no matter how perceptive the findings or provocative the questions about teaching and learning, practicing teachers might not ever apply new ideas to their studio teaching. Why might that be?

The Newland, et al. findings suggest clue. The Design Information Research Group, exploring designers' acceptance of ideas generated by academics, used a typology of information seeking and working strategies to explain differences in the ways practicing architects sought new information. Perhaps the same typology applies to the ways practicing studio instructors would accommodate new information. Even though the instructional

studio is lodged in academia, for architecture teaching the studio instructors are the practitioners -- in this case they are practitioners of education. If this is so, these practicing instructors' accommodation of new ideas about teaching could be examined using Powell's (27) summary of the four styles as a template.

For "dynamic" practitioners -- the energetic and entrepreneurial innovators -- Powell describes a "challenging" form of information acquisition. "Dynamic" teachers (these categories would refer to information-acquisition styles, not necessarily styles of dealing with students) might more enthusiastically adopt new educational ideas especially if other teachers are involved; the personal, exciting and innovative would engage this teacher. If a faculty group discussed new ideas and decided that some among them would begin experimenting with their studio teaching, the "dynamic" instructor would be first in the queue.

"Rigorous" thinkers with systematic and firmly held views about teaching would need structured and carefully designed presentations of new teaching ideas. Such teachers would need first to know that their existing ideas will not be rejected but rather expanded upon. Perhaps with this group more than any other, the notion that teaching is a form of designing would be appealing because of the implication that they can apply their well-established design knowledge to the educational realm.

"Focused" often describes beginning teachers -- whether in

studios or elsewhere in academe -- who concentrate on their need for tangible, immediately useful information. The Design Group's characterization of "focused" architects fits these new teachers (and many other more experienced teachers as well). The teacher seeking practical information is uncomfortable with theoretical conceptualizations such as "practical arguments" and "strategies for guiding student work" but might be eager to apply, for example, practical suggestions about ways to use prototypes with residential design problems, or practical suggestions about planning a constructive, worthwhile final jury.

"Watching-thinking," contemplative teachers may themselves be the theoreticians proposing new educational ideas, or may be the studio teachers considering those ideas. In contrast with the "focused" teacher, contemplative teachers would be better influenced by a conceptual and detailed set of ideas addressing the full range of educational thought and teaching practices. Seeing their own teaching in the context of this larger montage, they might then change their larger conceptualizations and hence their daily instructional practices.

REPRISE

Applying principles of design thinking and design process to the thought processes of teaching reveals possibilities yet unexplored -- possibilities both for research on design teaching and for improvement of studio instruction. As with any effort to understand and change human behavior, however, the challenges can

appear at first to outweigh the benefits of embarking on such an adventure. With examples of research on studio instruction, these paragraphs have shown that inquiry about teaching can be as excitingly complex as inquiry about design. It is in applying the results of research on studio instruction that questions of selective information handling are as convoluted for education as they are for design.

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